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e-MIS validity applied to TELMA enhanced learning environment

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e-MIS validity, cognitive skills, training, technology enhanced learning

Purpose

Enhanced learning environments are arising with great success within the field of cognitive skills training in minimally invasive surgery (MIS) because they provides multiple benefits since they avoid time, spatial and cost constraints. TELMA [1,2] is a new technology enhanced learning platform that promotes collaborative and ubiquitous training of surgeons. This platform is based on four main modules: an authoring tool, a learning content and knowledge management system, an evaluation module and a professional network. TELMA has been designed and developed focused on the user; therefore it is necessary to carry out a user validation as final stage of the development. For this purpose, e-MIS validity [3] has been defined. This validation includes usability, contents and functionality validities both for the development and production stages of any e-Learning web platform. Using e-MIS validity, the e-Learning is fully validated since it includes subjective and objective metrics. The purpose of this study is to specify and apply a set of objective and subjective metrics using e-MIS validity to test usability, contents and functionality of TELMA environment within the development stage.

Methods

Eight surgeons participated in the study. All participants carried out a list of tasks to be performed in TELMA. Selected tasks were: T1) signing up in TELMA; T2) creating a surgical video; T3) editing the surgical video; T4) viewing a didactic unit and make the evaluation test; and T5) creating a question or contribution. All experiences were recorded and analyzed accordingly to e-MIS validity. Usability validity was performed by web analytics method as well as a check list. Within the web analytics method, the following Key Performance Indicators (KPI) has been defined:

- KPI1: Average clicks per task.
- KPI2: Percentage of users that fully perform the task.
- KPI3: Average total time per task (in seconds).
- KPI4: Number of clicks to access the functionality.
- KPI5: Efficiency defined as the minimum number of clicks that are necessary to completely finish the task divided by the average clicks per task.

Content validity was determined using a subjective user satisfaction questionnaire and functionality validity was assessed with a checklist.

Results

Results of usability validity are shown in Table 1 and Figure 1. Table 1 includes KPI's values and checklist results can be seen in Figure 1. Ideal value has been obtained after the execution of the tasks by an expert administrator of TELMA. Figure 2 shows the scores regarding to content validity. These questions had to be answered in a 5-point Likert scale, where 1 stood for the lowest punctuation and 5 for the highest one. Finally, Table 2 includes functionality validity results.

Table 1. Results of usability validity. Data shown as obtained real value / ideal value

	KPIs (Real/Ideal)				
Task	KPI1	KPI2	KPI3	KPI4	KPI5
T1	17.5/14	100%/100%	134.8/50	1.3/1	0.8
T2	29.2/25	100%/100%	211.6/122	1/1	0.9
T3	5.6/4	20%/100%	153.0/79	1.4/1	0.7
T4	9.2/11	100%/100%	141.8/159	2/2	1.2
T5	13.6/7	100%/100%	122.2/108	2.4/2	0.5

Table 2. Results of functionality validity. Data are expressed as percentage of users that agree with the statement

	Score
Navigation through the website is easy	100.0%
The site provides a convenient search engine to find contents and allows advanced search	87.5%
The website provides easy-to-use interactive features between the system and the user	87.5%
The user can access all contents of the website without needing to download and install additional plugins	100.0%
The user sign-in form is easy and acceptable	100.0%
Online Authoring Tool allows creating surgical videos in an ease and correct way	87.5%

In general, users are able to accomplish all tasks in an effective way (close to the minimum number of necessary clicks). The exception is the visualization of the didactic unit where users did less clicks than the expert. This is due to the fact that users did not follow all requested steps before the evaluation test and skipped some parts of the didactic unit. This should be changed in the final implementation of TELMA in order to avoid the user to miss fundamental information within the learning process. It is also interesting to remark that the necessary click to get any of the functionalities of TELMA is low (two clicks as maximum) in order to make easier to the user to find them and user are in general able to get them in few steps. Users positively rate the design and layout of TELMA, obtaining in all case an agreement rate over 75%.

Conclusions

This study validates TELMA enhanced learning environment in its development stage from the point of view of the user. Usability validity shows that the user interface of TELMA is easy to use and attractive to users. Content validity is acceptable despite the

fact that TELMA is a prototype. Under the running stage of TELMA, these diversity and innovative contents will be enhanced through the active collaboration of users. Regarding to functionality validity, TELMA meets the user's requirements since it allows the creation of multimedia didactic contents in an easy and correct way, navigation through the platform is easy for the user and it provides an easy way for the user to interact with it. Therefore, TELMA is well accepted by users but some features must still be enhanced in order to obtain an enhanced learning platform of high quality for minimally invasive surgery.

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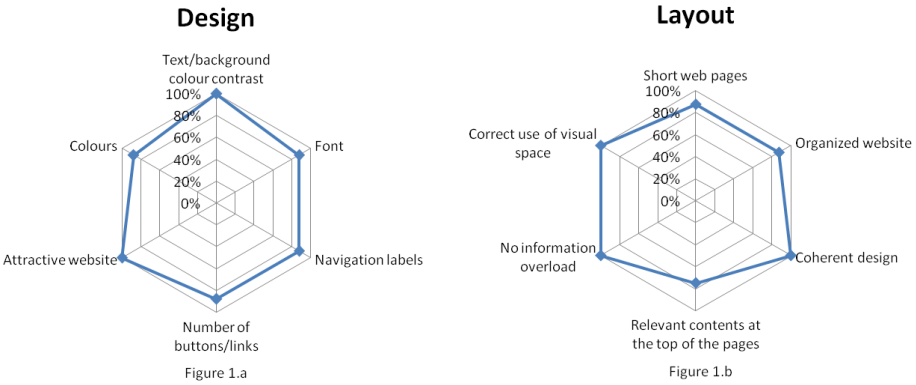

***Figure 1**. Usability validity*

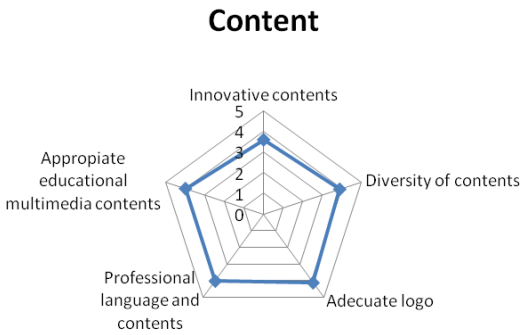

***Figure 2**. Content validity*